

NAVSHIPREPFAC YOKOSUKA  
LOCAL STANDARD ITEM

FY-02

ITEM NO: 099-17YO  
DATE: 01 JUL 2001  
CATEGORY: II

1. SCOPE:

1.1 Title: Rotating Electrical Equipment; repair

2. REFERENCES:

- a. NAVSHIPREPFAC Yokosuka Local Standard Items
- b. Equipment **Technical** Manual
- c. S9086-KC-STM-010/CH-300, Electric Plant - General
- d. S9086-KE-STM-010/CH-302, Electrical Motors and Controllers
- e. S9086-KN-STM-010/CH-310, Electrical Power Generators and Conversion Equipment
- f. S9086-HN-STM-010/CH-244, Propulsion Bearings and Seals
- g. 0900-LP-060-2010, **Electrical Machinery Repair**, Volume One, Electrical Machinery Repair, Electrical Motor Repair, **Shop Procedures Manual**
- h. S9310-AC-HBK-010, Commutator/Slip Ring Maintenance Handbook
- i. MIL-STD-870, Cadmium Plating, Low Embrittlement, Electrodeposition
- j. MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety

3. REQUIREMENTS:

3.1 Accomplish preliminary repair preparations as follows:

3.1.1 Prior to disconnecting equipment:

3.1.1.1 Record and retain electrical hook-up data, thrust readings and air gap readings. Record and retain bearing clearances for sleeve bearing equipment only.

3.1.1.2 Inspect couplings for cracks, broken segments, wear, and misalignment in excess of tolerances specified in 2.b.

3.1.2 Disconnect the equipment electrically and mechanically, using 2.b for guidance.

3.1.2.1 Matchmark, identify, and retain chocks, shims, shock mounts, sound damping pads, and other accessories associated with equipment.

3.1.2.2 Record motor shaft thrust and run out readings.

3.2 Remove equipment including rotating components connected directly to the shaft.

3.3 Inspect foundations for cracks, areas of distortion, and deterioration in excess of 25 percent of the thickness of each member of the structure.

3.4 Submit four legible copies of a report listing inspection results, missing parts, defective parts, and measurements taken in 3.1 and 3.3 to NAVSHIPREPFAC.

3.5 Matchmark, disassemble and inspect the equipment removed in 3.2, using 2.b through 2.g for guidance.

3.6 Accomplish a 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2, 300-3.2.3, 300-3.4.8, 300-3.4.11 and 300-5.3.7.1 of 2.c for guidance. Record data.

3.6.1 Disconnect solid-state devices and ground temperature sensing leads prior to measuring insulation resistance of windings.

3.7 Accomplish a DC resistance test of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one milliohm (.001 ohm). Record phase balance for multi-phase equipment, using Paragraph 4-5.1.b of 2.g for guidance. Record data.

3.8 Accomplish a voltage surge test in accordance with Paragraphs 300-3.5.4 and 300-3.5.5 of 2.c. Record data.

3.9 Accomplish a DC high-potential test in accordance with Paragraph 300-3.5.2 of 2.c. Record data.

3.10 Accomplish a polarization index test in accordance with Paragraph 300-3.4.12 of 2.c. Record data.

3.11 Measure resistance value of each winding temperature detector, heaters, and heater strips, using low voltage ohmmeter. Record data.

3.12 Submit four legible copies of a report listing the results of the requirements of 3.5 through 3.11 to NAVSHIPREPFAC.

3.13 Clean the equipment and windings in accordance with Paragraphs 300-4.5.1 through 300-4.5.5 of 2.c.

3.13.1 Dry the equipment by placing it in an oven in accordance with Paragraph 300-5.3.2.3 of 2.c.

3.14 Allow to cool to ambient temperature and accomplish a 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2, 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-5.3.7.1 of 2.c for guidance. Record data.

3.15 Accomplish a DC high-potential test in accordance with Paragraphs 300-3.5.2.3 of 2.c. Record data.

3.16 Repeat cleaning, drying, and testing in 3.13 through 3.15 if DC high-potential test readings are questionable, or if insulation resistance readings are not in accordance with the following:

3.16.1 DC generators and motors (except propulsion and auxiliary generators for submarines) including exciters, Table 300-3-4 of 2.c.

3.16.2 DC propulsion generators and motors and DC auxiliary generators for submarines, Table 300-3-5 of 2.c.

3.16.3 AC generators and motors other than propulsion, Table 300-3-6 of 2.c.

3.16.4 AC propulsion generators and motors, Table 300-3-7 of 2.c.

3.17 If satisfactory readings are not obtained after the second cleaning, repeat 3.13 through 3.15.

3.18 Notify NAVSHIPREPFAC if satisfactory readings are not obtained after a third cleaning.

3.19 Accomplish a DC resistance test of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one milliohm (.001 ohm). Record phase balance for multi-phase equipment, using Paragraph 4-5.1.b of 2.g for guidance. Record data.

3.20 Accomplish a voltage surge test in accordance with Paragraphs 300-3.5.4 and 300-3.5.5 of 2.c. Record data.

3.21 Submit four legible copies of a report listing winding defects such as opens, grounds, shorts, reversed or unbalanced coil groups or phases, incorrect connections, cracked or brittle insulation, and loose bands, fillers, wedges, and connections to NAVSHIPREPFAC.

3.21.1 Include test results from 3.14 through 3.17, 3.19 and 3.20.

3.22 Protect the windings and machined surfaces and clean the equipment housing exterior, including fan(s) and interior and exterior of end bells to bare metal.

3.22.1 Prime equipment housing, fans, and end bells with one coat F-84 alkyd zinc molybdate TT-P-645 (1.5 mils dry film thickness).

3.23 Inspect non-wound rotors for loose or cracked bars, localized overheating, and rubbing. Inspect wound rotors, slip ring leads, and armatures for insulation damage and burns/hot spots. Inspect for loose coils and slot wedges. Inspect slip rings and commutators for damage and for wear limits, using 2.b for criteria. Record data.

3.24 Inspect and dimensionally measure end bells, frame, rabbet fits, shaft, sleeve and pedestal bearings, keyways, fan, and running surfaces for wear, eccentricity, and other defects, using 2.b for accept or reject criteria, and 2.f for location and type of measurements to be taken. Record data.

3.25 Inspect brush rigging for cracks, chips, worn areas, distortion, spring condition, and insulating material for cracks and arc paths. Record data.

3.26 Inspect leads and terminal lugs for damage and defects. Identify and tag leads with aluminum wrap-around bands with metal stamped or embossed markings. Record data.

3.27 Submit four legible copies of a report listing results of the requirements of 3.23 through 3.26 to NAVSHIPREPFAC.

(V)(G) "VARNISH TEMPERATURE, VISCOSITY AND GEL TIME TESTS"

3.28 Select the proper insulating process based on winding insulation classifications and to meet applicable air pollution standards.

3.28.1 Select varnish methods and material, using Paragraphs 300-4.5.8 through 4.5.8.2 of 2.c for guidance.

3.28.1.1 Maintain the varnish in accordance with Paragraphs 300-4.5.8.3 through 300-4.5.8.3.3 of 2.c and the varnish manufacturer's instructions.

3.28.1.2 Maintain a current revision of the varnish manufacturer's instructions on maintenance, storage, and use of the type of varnish to be applied.

3.28.1.3 Maintain a record of varnish temperature, viscosity and, for solventless varnish, gel time tests. Tests must show varnish is within varnish manufacturer's recommendations and have been accomplished in the intervals specified by the varnish manufacturer. The record must also show the varnish is being stored as recommended by the varnish manufacturer.

3.29 Varnish windings in accordance with Paragraphs 300-4.5.8.2 of 2.c and the varnish manufacturer's instructions.

3.29.1 Do not immerse the leads.

3.29.2 Wipe surfaces that affect assembly, such as rabbet fits and mounting flanges, with a cloth moistened with a solvent after draining and before baking.

3.30 Remove excess varnish runoff from the component locations described in 3.29.2, after baking. Apply a thin coat of air dry varnish to metal surfaces exposed by the removal process in accordance with Paragraphs 300-4.5.8.5 and 300-4.5.8.6 of 2.c.

3.31 Repeat tests described in 3.14, 3.15, 3.19 and 3.20.

3.32 Accomplish an AC high-potential test in accordance with Paragraphs 300-3.5.3 of 2.c. Record data.

3.33 Accomplish a 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2, 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-5.3.7.1 of 2.c for guidance. Record data.

**3.34 Measure resistance value of each winding temperature detector, using a low voltage ohmmeter. Record data.**

3.35 Submit four legible copies of a report listing the results of the requirements of 3.31 through 3.34 to NAVSHIPREPFAC.

3.36 True the commutator and/or collector rings. Eccentricity shall not exceed ***the requirements of 2.h.*** Resurface or machine each individual collector ring to the same exact diameter to allow symmetrical brush holder to ring clearance spacing. Ensure metal shavings are not permitted to contaminate the rotor or stator assembly.

3.36.1 Each cut shall not exceed 0.010 inch. Finish thickness shall not be less than design wear tolerance as shown in 2.b.

3.36.2 Undercut the mica between the commutator bars with the edge of the mica not exceeding a depth of 5/64-inch below the bars.

3.36.3 Chamfer the bar edges and remove rough surfaces in accordance with Paragraph 5-2-4 of 2.h.

3.36.4 Burnish the commutator with a very fine commercial burnishing stone conforming to A-A-58052. Polish collector rings to a mirror finish.

3.37 Accomplish the requirements of 099-15YO of 2.a for each rotating assembly.

3.38 Accomplish the following for the brush rigging:

3.38.1 Disassemble the brush rigging.

3.38.2 Remove foreign matter.

3.38.3 Replate cadmium plated items in accordance with 2.i. Replate zinc-plated items in accordance with ASTM A153. In localities with environmental or air pollution restrictions against cadmium plating, use zinc for all plated steel parts.

3.38.4 Recondition threads of plated parts.

3.38.5 Assemble brush rigging.

3.39 Repair lightly scored areas of frame, end bells, and shaft by manual methods. Recondition threads and fit key to keyway. Step keys shall not be used.

3.39.1 Apply a thin coat of petrolatum to unpainted mating surfaces except for explosion-proof motors which shall have clean, dry mating surfaces.

3.40 Prepare and refinish equipment. Protect machine surfaces, windings, and nameplates from being painted or otherwise damaged.

3.40.1 Accomplish the requirements of 099-32YO of 2.a for each housing, fan, and interior and exterior of each end bell.

***3.41 Accomplish the requirements of 099-32YO of 2.a for the foundations of the removed equipment.***

3.42 Accomplish the following on equipment having other than sleeve-type bearings unless otherwise specified in the invoking Work Item, using 2.g for guidance.

3.42.1 Install new bearings, seals, fittings, lock washers, and lock nuts conforming to 2.b, using 2.f and Chapter 6 of 2.g for guidance.

3.42.1.1 Install new Type 111, Class 8 (sealed) bearings with a C3 radial internal clearance in vaneaxial and tubeaxial fan motors originally furnished with Type 111 bearings. Install Type 120 bearings in vaneaxial and tubeaxial fan motors originally furnished with Type 120 bearings.

3.42.2 Lubricate bearings with grease conforming to DOD-G-24508 as required in Paragraphs 244-1.7.7.1 and 244-1.7.7.3 of 2.f.

3.42.2.1 Install new label plates with the inspection "DO NOT LUBRICATE" on equipment with sealed bearings (Type 111, Class 8 or Type 120).

3.43 Assemble the equipment disassembled in 3.5, using 2.b through 2.g for guidance.

3.43.1 Do not use materials containing silicone in the repair and **assembly** of equipment with commutator or collector rings.

3.43.2 Install new fasteners conforming to MIL-**DTL**-1222, Type I or II, Grade 5, zinc coated.

3.43.3 Fasteners requiring a permeability factor of 2.0 or less shall conform to Grade 304 CRES.

3.43.4 Install new gaskets on covers, inspection plates, and between the external connection box and the frame. Gaskets shall conform to MIL-PRF-1149 unless otherwise specified in 2.b.

3.43.5 Set brush holders not less than 1/16-inch or more than 1/8-inch from the commutator or collector rings unless otherwise specified in 2.b.

3.43.6 Set brush holders in **electrical neutral plane** and stagger brushes for maximum coverage of the commutator, in accordance with Paragraph 300-4.7.7.1.10 of 2.c.

3.43.7 Center the brush holder over the collector rings.

3.43.7.1 Ensure the brushes do not extend beyond the edge of the collector rings.

3.43.8 Install new brushes in accordance with 2.b. Sand new brushes to fit curvature of the commutator or collector rings, using Paragraph 4-4-4.2 through 4-4-4.4 of 2.h for guidance.

3.43.8.1 Brushes shall have a surface contact of 100 percent and shall not be chipped, **cracked**, or broken.

3.43.8.2 Remove sand, carbon, and other foreign matter resulting from fitting new brushes.

3.43.9 Adjust spring tension of brushes in accordance with 2.b.

3.43.10 Adjust air gap **as** specified in 2.b, **plus or minus 10 percent**.

3.43.11 Rotate shaft by hand a minimum of three revolutions. **Rubbing or binding of rotating assembly not allowed.**

3.43.12 Install label plates conforming to MIL-DTL-15024 for those found to be missing or damaged.

(V)(G) "NO-LOAD SHOP TEST"

3.44 Accomplish a no-load shop test of the motor for a minimum of one-half hour.

3.44.1 After one-half hour, record current and voltage in each phase, speed and bearing temperature rise measured on the equipment's exterior near each bearing.

3.44.2 Submit four legible copies of the recorded data to NAVSHIPPREPFAC.

3.45 Install equipment removed in 3.2.

3.45.1 Remove existing and install new foundation fasteners conforming to MIL-**DTL**-1222, Type I or II, Grade 5, zinc coated, and self locking hexagon nuts conforming to NASM25027, excluding body-fitted bolts and studs.

3.45.2 Remove existing galled or distorted body-fitted bolts and studs and install new fitted bolts and studs conforming to MIL-**DTL**-1222, Type I, Grade 5.

3.45.3 Fasteners, body-**fitted** bolts, and studs requiring a permeability factor of 2.0 or less shall conform to Grade 304 CRES.

3.45.4 Align equipment in accordance with 2.b. **Measure and record facial and peripheral coupling data.**

3.45.4.1 Install chocks, shims, ground straps, shock mounts, and sound damping pads.

3.45.4.2 Accomplish the requirements of 099-58YO of 2.a for driver and pump shafts.

3.45.5 Connect electrical cables to equipment, using data retained in 3.1.1.1.

3.45.6 Bond and ground equipment in accordance with 2.j, using new ground straps.

3.45.7 Rotate shaft by hand a minimum of three revolutions. **Rubbing or binding of rotating assembly not allowed.**

3.45.8 Measure and record the air gap and bearing clearance (sleeve bearing equipment only), insulation resistance (at 500 volts DC), and thrust.

(V)(G) "OPERATIONAL TEST"

3.46 Accomplish an operational test of the equipment at full nameplate load or maximum system capacity for minimum of one hour after temperatures stabilize, unless otherwise specified in the invoking Work Item.

3.46.1 Verify oxide film coating of the commutator/collector rings in accordance with 2.h.

3.46.2 Record current, voltage, frame and bearing temperature rise, and speed at 15 minute intervals.

3.46.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit unless otherwise specified in the invoking Work Item or equipment instruction manual.

3.46.3 Measure and record hot insulation resistances of windings to ground immediately upon completion of test, using a 500-volt megger.

3.47 Submit four legible copies of a report listing data recorded in 3.45.5, 3.45.8, 3.46.2, and 3.46.3 to NAVSHIPREPFAC.

4. NOTES:

4.1 Equipment instruction manual and drawings will be **listed** in the invoking Work Item.

4.2 Shop test of generator will be addressed in the invoking Work Item.

4.3 The use of silicone is not allowed on any rotating electrical machinery.